KOE

JDI Group

Kaohsiung Opto-Electronics Inc.

FOR MESSRS:_____ DATE : May 31st ,2012

CUSTOMER'S ACCEPTANCE SPECIFICATIONS

TX43D50VM0BAA

Contents

ACCEPTED BY:_____ PROPOSED BY: Elton Lin

2. RECORD OF REVISION

DATE	SHEET No.	SUMMARY

3. GENERAL DATA

3.1 DISPLAY FEATURES

This module is a 17” WXGA amorphous silicon TFT. The pixel format is vertical stripe and sub pixels are arranged as R (red), G (green), B (blue) sequentially. This display is RoHS compliant, COF (chip on film) technology and LED backlight are applied on this display.

Part Name	TX43D50VM0BAA
Module Dimensions	400.0(W) mm x 258.0(H) mm x 20.0 (D) mm typ.
LCD Active Area	369.6(W) mm x 221.76(H) mm
Pixel Pitch	0.28875(W) mm x 0.28875 (H) mm
Resolution	1280 x 3(RGB)(W) x 768(H) dots
Color Pixel Arrangement	R, G, B Vertical stripe
LCD Type	Transmissive Color Mode; Normally Black Mode
Display Type	Active Matrix
Number of Colors	16.7M Colors
Backlight	Edge Light Type with White LED
Weight	1700 typ. (g)
Interface	1-channel LVDS (LVDS:Low Voltage Differential Signaling)
Power Supply Voltage	5V for LCD; 12V for Backlight
Viewing Direction	Super Wide Version (In-Plane Switching)

3.2 APPLICATION AND OTHERS

(1) This LCD module was designed and manufactured to be used in an air-conditioned room away from direct sunlight.

(2) This LCD module cannot be applied to an instrument which requires extremely high reliability and safety from its functions and precision. These instruments include medical equipment which affects life- and/or wealth-support apparatus.

(3) Any problems caused by a use with deviation from the conditions mentioned in this specification are not included in the warranty.

(4) Maintenance
This LCD module and the aforementioned data may be changed without notice. When you demand maintenance parts, please inquire about the changes in advance.

(5) Repair
We will replace or repair all defective modules if the relevant defect is caused by KOE. However, we will not take any responsibilities for defective modules after the expiration of warranty period. Also, if you access the modules for repairs, we will not warrant them either even if it is within the warranty period.

(6) Items in this specification may be changed for improvement without prior notice. Please consult our sales division before engineering an instrument with this LCD module.

(7) When a question arises concerning the specification, please contact our sales division.

4. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min.	Max.	Unit	Remarks
Supply Voltage	VDD	0	6	V	-
Input Voltage of Logic	VI	-0.3	3.4	V	Note 1
Operating Temperature	Top	0	50	°C	Note 2
Storage Temperature	Tst	-20	60	°C	Note 2
Backlight Input Voltage	VLED	-	(18)	V	-

Note 1: It is applied to LVDS signal.

Note 2: Temperature and Humidity should be applied to the center glass surface of TFT module, not to the system installed with a module. The temperature at the center of rear surface should be less than 60°C on the condition of operating. Function of module is guaranteed in above operating temperature range, but optical characteristics is specified for only 25°C operating condition.

5. ELECTRICAL CHARACTERISTICS

5.1 LCD CHARACTERISTICS

$T_a = 25\ ^{\circ}C,\ \mathrm{VSS} = 0\mathrm{V}$

Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
Power Supply Voltage	VDD	4.5	5	5.5	V	-
Input Voltage of Logic	VI	-0.3	-	3.4	V	-
Power Supply Current	IDD	-	430	520	mA	Note 2
Vsync Frequency	f_v	50	60	65	Hz	Note 3
Hsync Frequency	f_H	44.8	47.1	52.3	KHz	Note 3
CLK Frequency	f_{CLK}	65	66	73	MHz	Note 3

Note 1: It is applied to except LVDS signal.

Note 2: Temperature and Humidity should be applied to the center glass surface of TFT module, not to the system installed with a module. The temperature at the center of rear surface should be less than 60°C on the condition of operating. Function of module is guaranteed in above operating temperature range, but optical characteristics is specified for only 25°C operating condition.

Note 3: As this module contains fuse (1.0A), prepare current source that is enough for cutting current fuse (larger than 2.5A) or set a protection circuit when a trouble happens.

Note 4: The picture on typcal current is white picture.

Note 5: When at low frequency drive, flicker may appear on screen. Please verify the flicker level before system design.

5.2 BACKLIGHT CHARACTERISTICS

$T_a = 25\ ^{\circ}C$

Item		Symbol		Min.	Typ.	Max.	Unit	Remarks
Input Voltage		Vin		10.8	12.0	13.2	V	-
Input Current		Iin		-	(1.36)	1.9	A	Note 1
ON/OFF Control Voltage	ON	ON/OFF		2.5	-	5.0	V	B/L=ON
	OFF			0	-	0.8	V	B/L=OFF
Brightness Control Voltage		Vbc		1.0	-	3.6	V	Note 2
PWM dimming signal Input Voltage		PWM	High	2.9	-	5.0	V	Note 3
			Low	0	-	0.9	V	-
PWM Frequency		PWMf		140	150	160	Hz	-

Note 1: VIN=12.0V, VBC=3.3V or PWMf=150Hz and display pattern is a full White (Gray scale = 255 level).

Note 2: A protection fuse is built into this module. As this module contains fuse (1.0A), prepare current source that is enough for cutting current fuse (larger than 2.5A) or set a protection circuit when a trouble happens.

Note 3: The picture on typcal current is white picture.

V_{BC} (Typ.)	Brightness
1.0V	20%
1.3V	30%
1.5V	40%
1.8V	50%
2.0V	60%
2.3V	70%
2.5V	80%
2.8V	90%
Above 3.0V	100%

Note 4: Brightness Control (Reference value)

PWM (Typ.)	Brightness
5%	5%
10%	10%
20%	20%
30%	30%
40%	40%
50%	50%
60%	60%
70%	70%
80%	80%
90%	90%
100%	100%

6. OPTICAL CHARACTERISTICS

The following optical characteristics are measured when the LCD is set alone (apart from driving circuits and monitor cabinets) and under stable conditions. It takes about 30 minutes to reach stable conditions. The measuring point is the center of display area unless otherwise noted.
The optical characteristics should be measured in a dark room or equivalent state.

Measuring equipment : KONICA MINOLTA: CS-2000 or equivalent.
Ambient Temperature=25±3°C, VDD=5.0V, fV=60Hz, VIN=12.0V,
and VBC=3.3V or PWM=100% (PWMf=150Hz)

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remarks
Brightness of White		Bwh	$\theta = 0^\circ$	420	500	-	cd/m^2	Note 1,2
Brightness Uniformity		Buni		75	-	-	%	Note 3
Contrast Ratio		CR		700	1000	-	-	Note 4
Response Time	Rise	ton	ton	-	12	20	ms	Note5
	Fall	toff	toff	-	10	18		
Color Chromaticity (CIE)	Red	X	$\theta = 0^\circ$	0.621	0.651	0.681	-	Note 6
		Y		0.298	0.328	0.358		
	Green	X		0.280	0.310	0.340		
		Y		0.588	0.618	0.648		
	Blue	X		0.118	0.148	0.178		
		Y		0.025	0.055	0.085		
	White	X		0.283	0.313	0.343		
		Y		0.299	0.329	0.359		
Contrast Ratio at 85°		CR 85°	$\theta = 85^\circ$ $\phi = 0^\circ, 90^\circ, 180^\circ, 270^\circ$	10	-	-	-	-
NTSC Ratio			$\theta = 0^\circ$	-	72	-	%	-

Note 1: The brightness is measured from the panel center point, P5 in Fig. 6.2, for the typical value.

Note 2: Brightness of white is measured by LCM is light up after 30 minutes .

Note 3: The brightness uniformity is calculated by the equation as below:

$$\text{Brightness uniformity} = \frac{\text{Min. Brightness}}{\text{Max. Brightness}} \times 100\%$$

, which is based on the brightness values of the 9 points measured by CS-1000A as shown in Fig. 6.2.

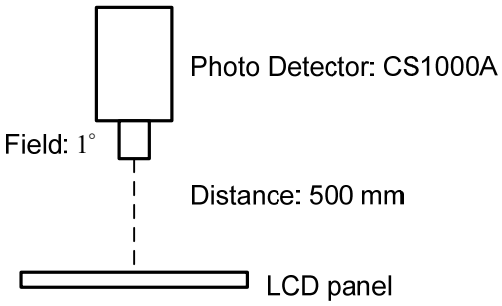


Fig. 6.1

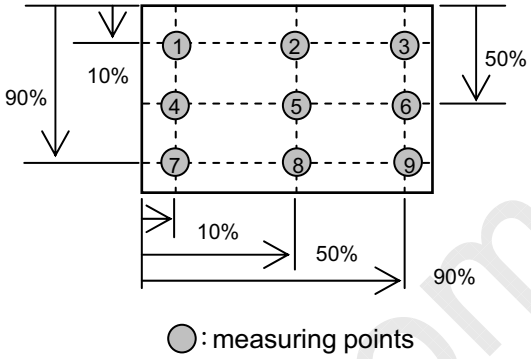


Fig. 6.2

Note 4: The Contrast Ratio is measured from the center point of the panel, P5, and defined as the following equation:

$$CR = \frac{\text{Brightness of White}}{\text{Brightness of Black}}$$

Note 5: The definition of response time is shown in Fig. 6.3. The rising time is the period from 10% brightness to 90% brightness when the data is from black to white. Oppositely, Falling time is the period from 90% brightness rising to 10% brightness.

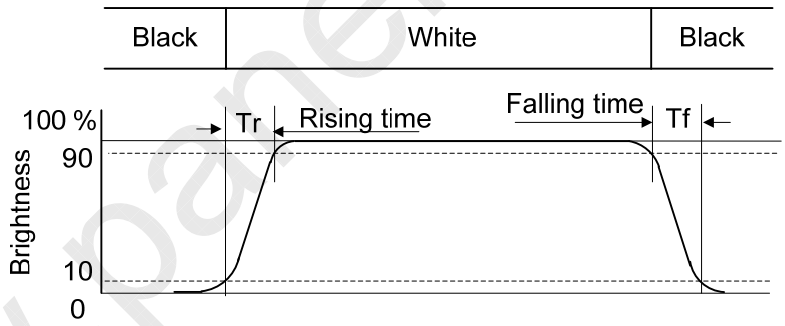
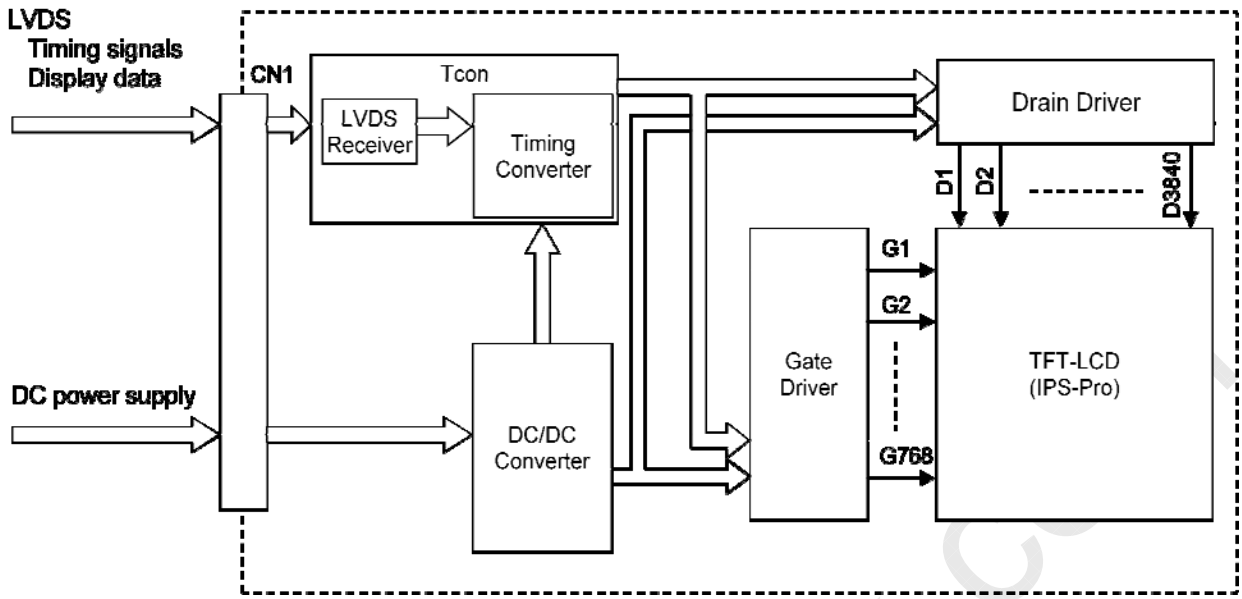


Fig 6.3

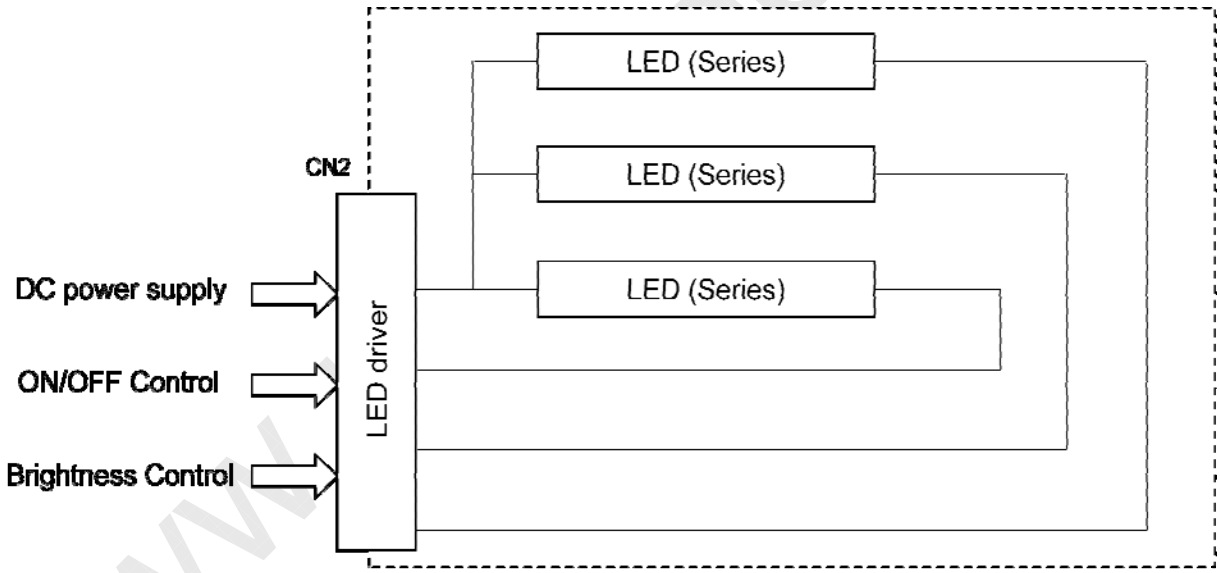
Note 6: The color chromaticity is measured from the center point of the panel, P5, as shown in Fig. 6.2.

7. BLOCK DIAGRAM

7.1 TFT Module



7.2 Back light unit



8. INTERFACE PIN ASSIGNMENT

8.1 TFT-LCD MODULE

CN1: JAE: FI-X30SSLA-HF or Equivalent
(Matching connector: JAE: FI-X30HL or FI-X30C2L-NPB or Equivalent)

Pin No.	Symbol	Function	Note
1	VDD	Power Supply (+5.0V)	4
2	VDD		
3	VDD		
4	VDD		
5	VSS	GND (0V)	1)
6	VSS		
7	VSS		
8	VSS		
9	TEST1	Test Pin (OPEN)	3)
10	TEST2	Test Pin (OPEN)	3)
11	VSS	GND (0V)	1)
12	RX0-	Pixel Data	2)
13	RX0+		
14	VSS	GND (0V)	1)
15	RX1-	Pixel Data	2)
16	RX1+		
17	VSS	GND (0V)	1)
18	RX2-	Pixel Data	2)
19	RX2+		
20	VSS	GND (0V)	1)
21	CLK-	Pixel Clock	2)
22	CLK+		
23	VSS	GND (0V)	1)
24	RX3-	Pixel Data	2)
25	RX3+		
26	VSS	GND (0V)	1)
27	AMODE	LVDS Mode Select	5)
28	TEST3	Test Pin (OPEN)	3)
29	TEST4	Test Pin (OPEN)	3)
30	VSS	GND (0V)	1)

Notes 1) All Vss pins should be grounded.

2) RXn- and RXn+ (n=0,1,2,3), CLK- and CLK+ should be wired by twist-pairs or side-by-side FPC patterns, respectively.

3) Please keep open.

4) All VDD pins should be connected to +50 V (typ.).

5) Please refer to page 8-4/5 "LVDS interface" for LVDS data mapping.

8.2 BACK-LIGHT UNIT

CN2 : TARNG YU Enterprise: TU2001WNR-12S
(Matching connector : JST PHR-12 or TARNG YU Enterprise TU2001HNO-12)

Pin No.	Symbol	Description	Note
1	V_{IN}	Power Supply (typ. 12.0V)	1)
2	V_{IN}		
3	V_{IN}		
4	V_{IN}		
5	ON/OFF	High : Backlight ON, Low : Backlight OFF	4)
6	V_{SS}	GND (0V)	2)
7	V_{SS}		
8	V_{BC}	Brightness Control Signal	5),6)
9	PWM	PWM Dimming Signal	3),6)
10	NC	NC	-
11	V_{SS}	GND (0V)	2)
12	V_{SS}		

Notes

1) All V_{IN} pins should be connected to +12.0V (Typ.).

2) All V_{SS} pins should be grounded. The metal bezel is internally connected to GND.

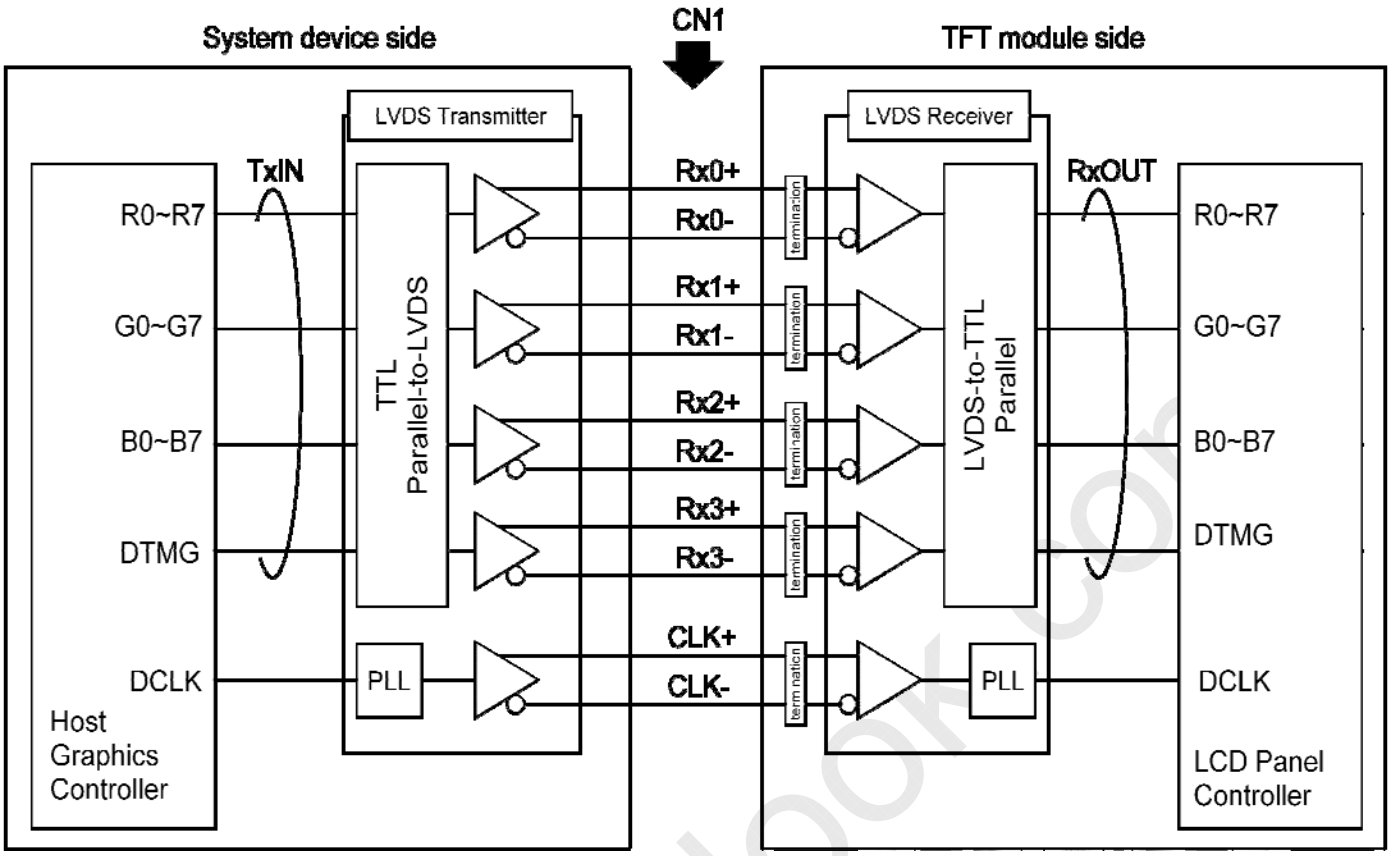
3) High level:2.5~5.0V, Low level:0~0.9

4) High level:2.5 ~ 5.0V DC, Low level:0 ~ 0.5V DC

5) Input Voltage : 1.0 ~ 3.6V DC

6) These signals can't input at the same time.

8.3 BLOCK DIAGRAM OF INTERFACE



Receiver: Equivalent of THC63LVDF84B by THine

R0~7 : R data
G0~7 : G data
B0~7 : B data
DTMG : Display timing data

Notes 1) The system must have a LVDS transmitter to drive a module.
2) The impedance of LVDS cable shall be about 100 ohms per twist-pair line when it is used differentially.

8.4 LVDS INTERFACE

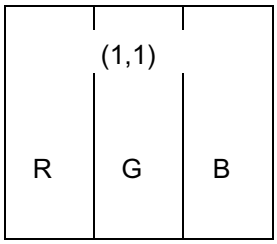
LVDS INTERFACE

27pin AMODE	Signal	Transmitter		Interface Connector		Receiver		TFT Control
		Pin	Input	System Device	TFT Module	Pin	Output	Input
=L (GND)	R0 (LSB)	51	TxIN0	Tx OUT0+	Rx IN0+	27	RxOUT0	R0 (LSB)
	R1	52	TxIN1			29	RxOUT1	R1
	R2	54	TxIN2			30	RxOUT2	R2
	R3	55	TxIN3			32	RxOUT3	R3
	R4	56	TxIN4	Tx OUT0-	Rx IN0-	33	RxOUT4	R4
	R5	3	TxIN6			35	RxOUT6	R5
	G0 (LSB)	4	TxIN7	Tx OUT1+	Rx IN1+	37	RxOUT7	G0 (LSB)
	G1	6	TxIN8			38	RxOUT8	G1
	G2	7	TxIN9			39	RxOUT9	G2
	G3	11	TxIN12			43	RxOUT12	G3
	G4	12	TxIN13			45	RxOUT13	G4
	G5	14	TxIN14	Tx OUT1-	Rx IN1-	46	RxOUT14	G5
	B0 (LSB)	15	TxIN15			47	RxOUT15	B0 (LSB)
	B1	19	TxIN18	Tx OUT2+	Rx IN2+	51	RxOUT18	B1
	B2	20	TxIN19			53	RxOUT19	B2
	B3	22	TxIN20			54	RxOUT20	B3
	B4	23	TxIN21			55	RxOUT21	B4
	B5	24	TxIN22			1	RxOUT22	B5
	RSVD 1)	27	TxIN24	Tx OUT2-	Rx IN2-	3	RxOUT24	Not use
	RSVD 1)	28	TxIN25			5	RxOUT25	Not use
	DTMG	30	TxIN26			6	RxOUT26	DTMG
	R6	50	TxIN27	Tx OUT3+	Rx IN3+	7	RxOUT27	R6
	R7 (MSB)	2	TxIN5			34	RxOUT5	R7 (MSB)
	G6	8	TxIN10			41	RxOUT10	G6
	G7 (MSB)	10	TxIN11			42	RxOUT11	G7 (MSB)
	B6	16	TxIN16			49	RxOUT16	B6
	B7 (MSB)	18	TxIN17	Tx OUT3-	Rx IN3-	50	RxOUT17	B7 (MSB)
	RSVD 1)	25	TxIN23			2	RxOUT23	Not use
	DCLK	31	TxCLK IN	TxCLK OUT+	RxCLK IN+	26	RxCLK OUT	DCLK
				TxCLK OUT-	RxCLK IN-			

27pin AMODE	Signal	Transmitter		Interface Connector		Receiver		TFT Control
		Pin	Input	System Device	TFT Module	Pin	Output	Input
=H (3.3V)	R2	51	TxIN0	Tx OUT0+	Rx IN0+	27	RxOUT0	R2
	R3	52	TxIN1			29	RxOUT1	R3
	R4	54	TxIN2			30	RxOUT2	R4
	R5	55	TxIN3			32	RxOUT3	R5
	R6	56	TxIN4	Tx OUT0-	Rx IN0-	33	RxOUT4	R6
	R7 (MSB)	3	TxIN6			35	RxOUT6	R7 (MSB)
	G2	4	TxIN7	Tx OUT1+	Rx IN1+	37	RxOUT7	G2
	G3	6	TxIN8			38	RxOUT8	G3
	G4	7	TxIN9			39	RxOUT9	G4
	G5	11	TxIN12			43	RxOUT12	G5
	G6	12	TxIN13			45	RxOUT13	G6
	G7 (MSB)	14	TxIN14	Tx OUT1-	Rx IN1-	46	RxOUT14	G7 (MSB)
	B2	15	TxIN15			47	RxOUT15	B2
	B3	19	TxIN18	Tx OUT2+	Rx IN2+	51	RxOUT18	B3
	B4	20	TxIN19			53	RxOUT19	B4
	B5	22	TxIN20			54	RxOUT20	B5
	B6	23	TxIN21			55	RxOUT21	B6
	B7 (MSB)	24	TxIN22			1	RxOUT22	B7 (MSB)
	RSVD 1)	27	TxIN24	Tx OUT2-	Rx IN2-	3	RxOUT24	Not use
	RSVD 1)	28	TxIN25			5	RxOUT25	Not use
	DTMG	30	TxIN26			6	RxOUT26	DTMG
	R0 (LSB)	50	TxIN27	Tx OUT3+	Rx IN3+	7	RxOUT27	R0 (LSB)
	R1	2	TxIN5			34	RxOUT5	R1
	G0 (LSB)	8	TxIN10			41	RxOUT10	G0 (LSB)
	G1	10	TxIN11			42	RxOUT11	G1
	B0 (LSB)	16	TxIN16			49	RxOUT16	B0 (LSB)
	B1	18	TxIN17	Tx OUT3-	Rx IN3-	50	RxOUT17	B1
	RSVD 1)	25	TxIN23			2	RxOUT23	Not use
	DCLK	31	TxCLK IN	TxCLK OUT+	RxCLK IN+	26	RxCLK OUT	DCLK
				TxCLK OUT-	RxCLK IN-			

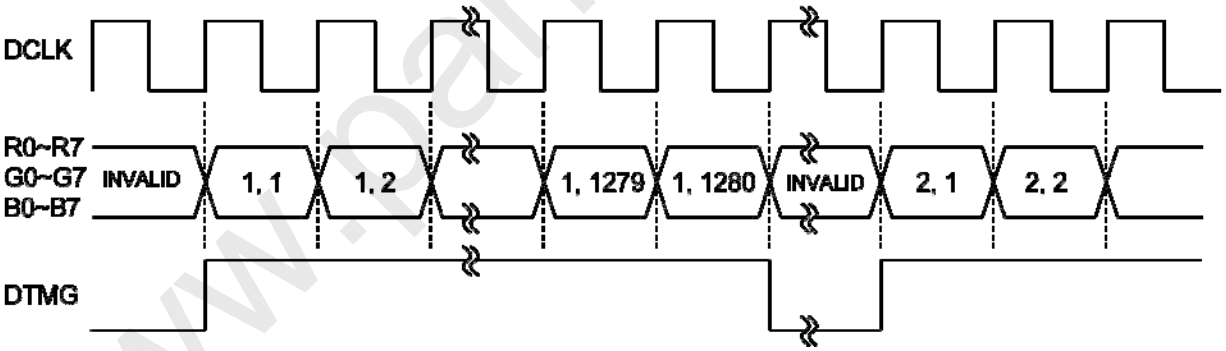
Note 1) RSVD (reserved) pins on the transmitter shall be "H" or "L".

8.5 CORRESPONDENCE BETWEEN INPUT DATA AND DISPLAY IMAGE



R0~R7 : R data
G0~G7 : G data
B0~B7 : B data

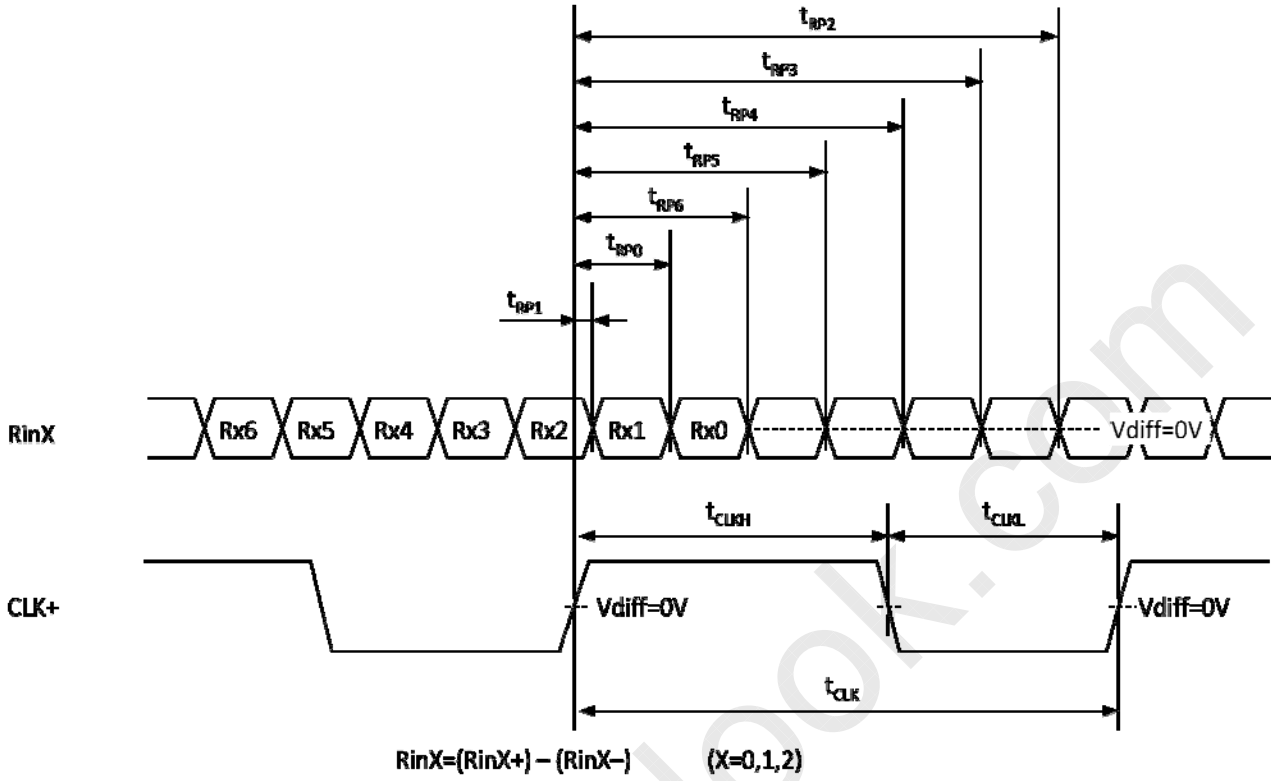
1,1	1,2	1,3	.....	1,1280
2,1	2,2	2,3	.....	2,1280
3,1	3,2	3,3	.....	3,1280
⋮	⋮	⋮		⋮
768,1	768,2	768,3	.....	768,1280



9. TIMING CHART

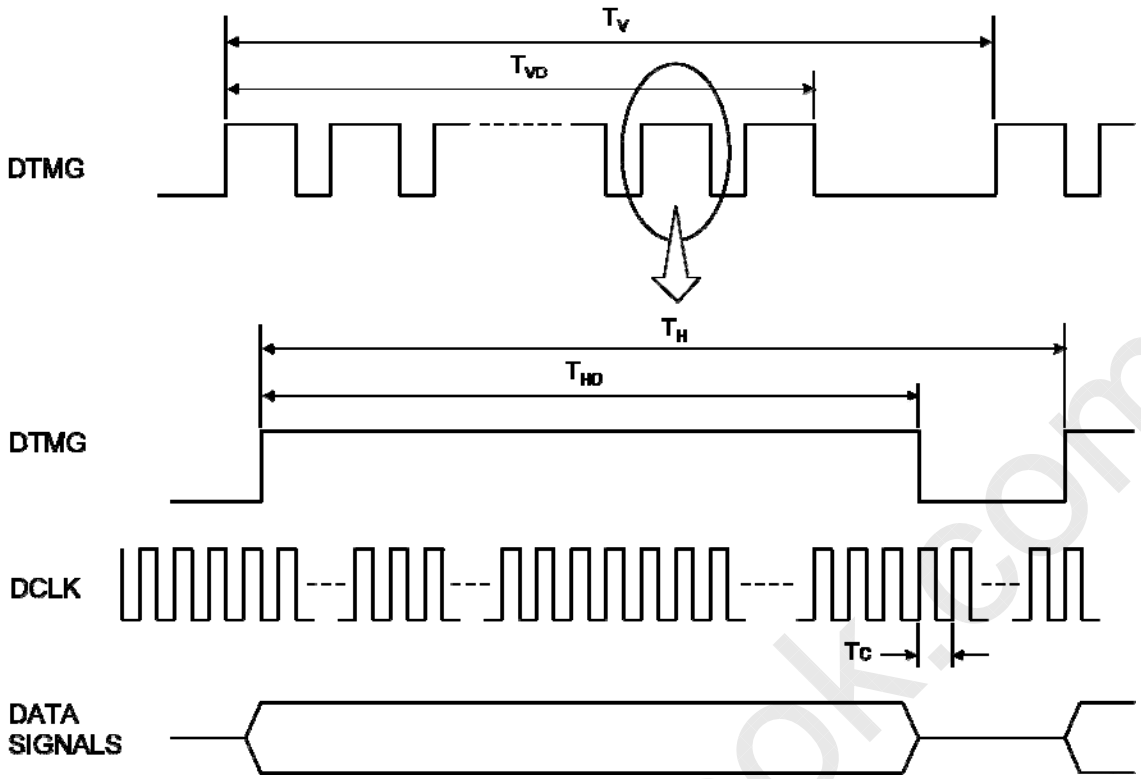
9.1 RECEIVER INPUT DATA POSITION

(Interface of TFT module)



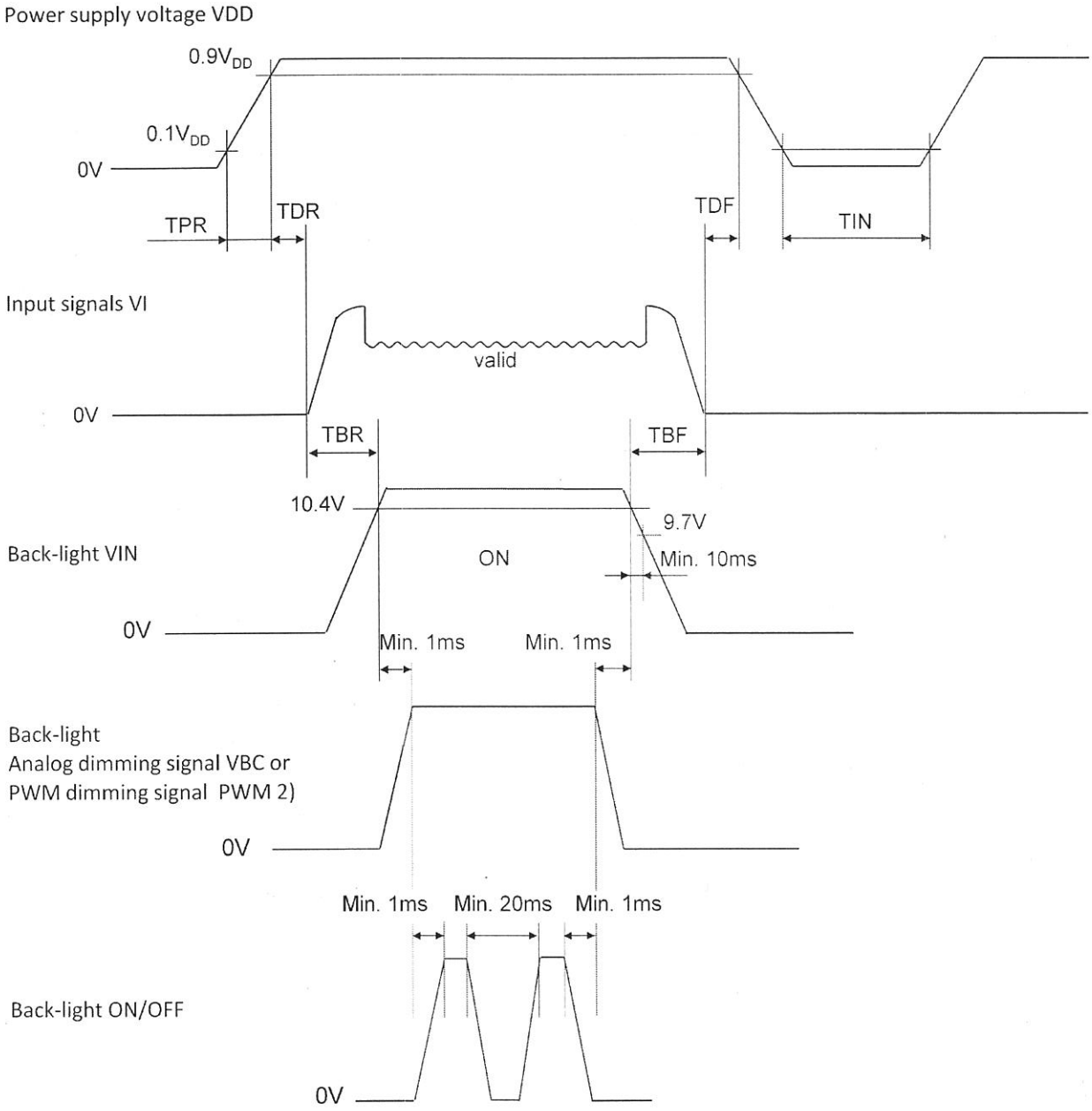
Item		Symbol	Min.	Typ.	Max.	Unit	Note
DCLK	Frequency	$1/t_{CLK}$	65	66	73	MHz	
RinX (X=0,1,2)	0 data position	t_{RP0}	$1/7t_{CLK}-0.44$	$1/7t_{CLK}$	$1/7t_{CLK}+0.44$	ns	
	1st data position	t_{RP1}	−0.44	0	+0.44		
	2nd data position	t_{RP2}	$6/7t_{CLK}-0.44$	$6/7t_{CLK}$	$6/7t_{CLK}+0.44$		
	3rd data position	t_{RP3}	$5/7t_{CLK}-0.44$	$5/7t_{CLK}$	$5/7t_{CLK}+0.44$		
	4th data position	t_{RP4}	$4/7t_{CLK}-0.44$	$4/7t_{CLK}$	$4/7t_{CLK}+0.44$		
	5th data position	t_{RP5}	$3/7t_{CLK}-0.44$	$3/7t_{CLK}$	$3/7t_{CLK}+0.44$		
	6th data position	t_{RP6}	$2/7t_{CLK}-0.44$	$2/7t_{CLK}$	$2/7t_{CLK}+0.44$		

9.2 TIMING COVERTER SIGNAL TIMING



Item		Symbol	Min.	Typ.	Max.	Unit	Note
DCLK	Cycle time	t_{CLK}	13.7	15.1	15.4	ns	
	Duty	D	0.35	0.5	0.65	-	
DTMG	Horizontal period	T_H	1396	1406	1450	t_{CLK}	
	Horizontal width-Active	T_{HD}	1280	1280	1280	t_{CLK}	
	Vertical period	T_V	773	783	825	T_H	
	Vertical width-Active	T_{VD}	768	768	768	T_H	
	Frame frequency	f_V	55	60	65	Hz	

9.3 TIMING BETWEEN INTERFACE SIGNALS AND POWER SUPPLY



Note 1) Timing of power supply voltage and input signals should be used under the following specifications.

1ms	≦	TPR	≦	10ms
40ms	≦	TDR		
20ms	≦	TDF	≦	50ms
		TIN	≧	1s
		TBR	≧	500ms
		TBF	≧	100ms

Note 2) These signals can't input at the same time.

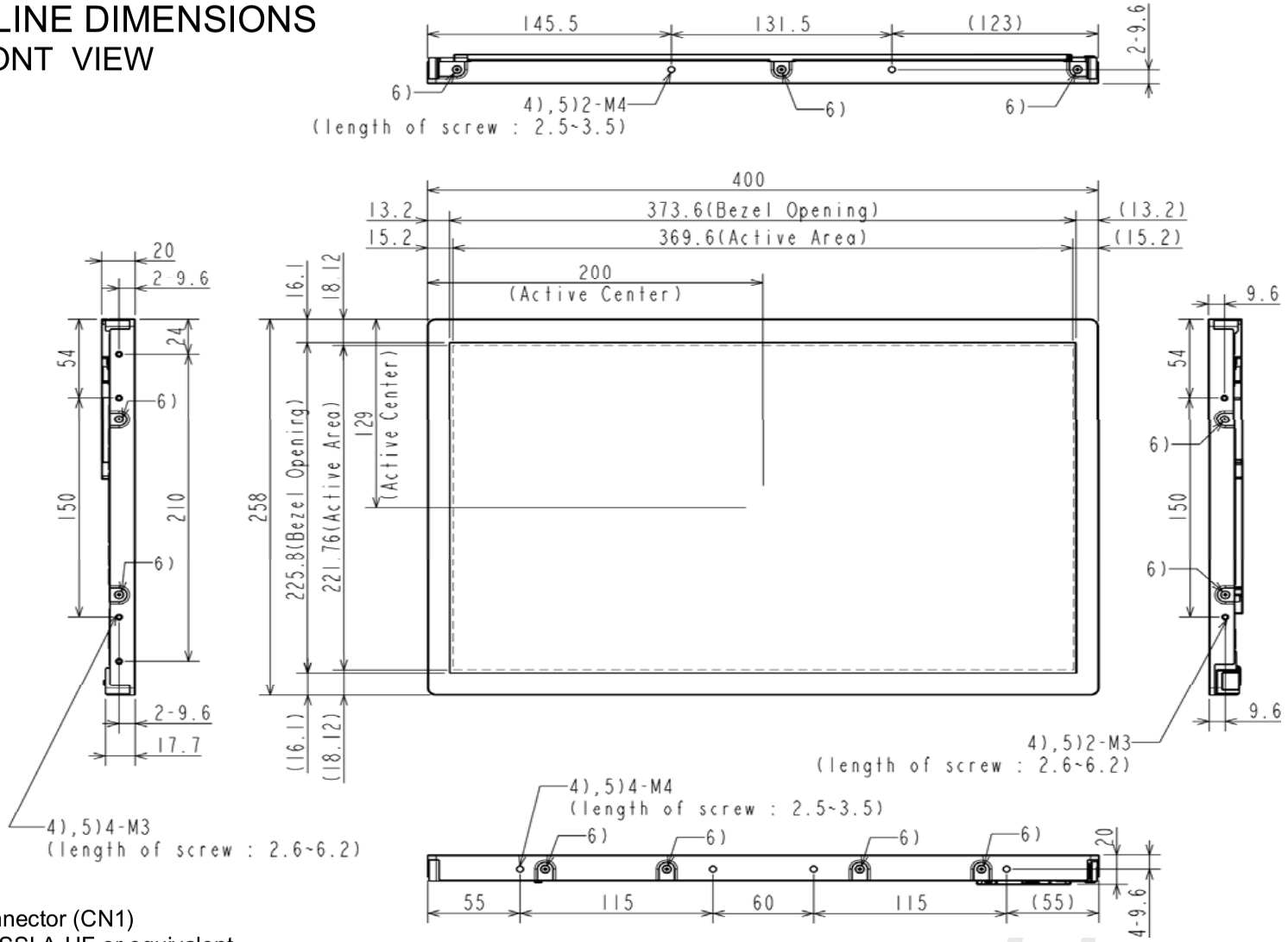
9.4 DATA INPUT for DISPLAY COLOR

Color \ Input data		R data								G data								B data							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
		MSB							LSB	MSB							LSB	MSB							LSB
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green (255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue (255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Red	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
	Red (254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
	Green (254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green (255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Blue	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
	Blue (254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue (255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Notes 1) Definition of gray scale: Color (n)
n indicates gray scale level. Higher n means brighter level.
2) Data signals: 1: High, 0: Low

10. OUTLINE DIMENSIONS

10.1 FRONT VIEW

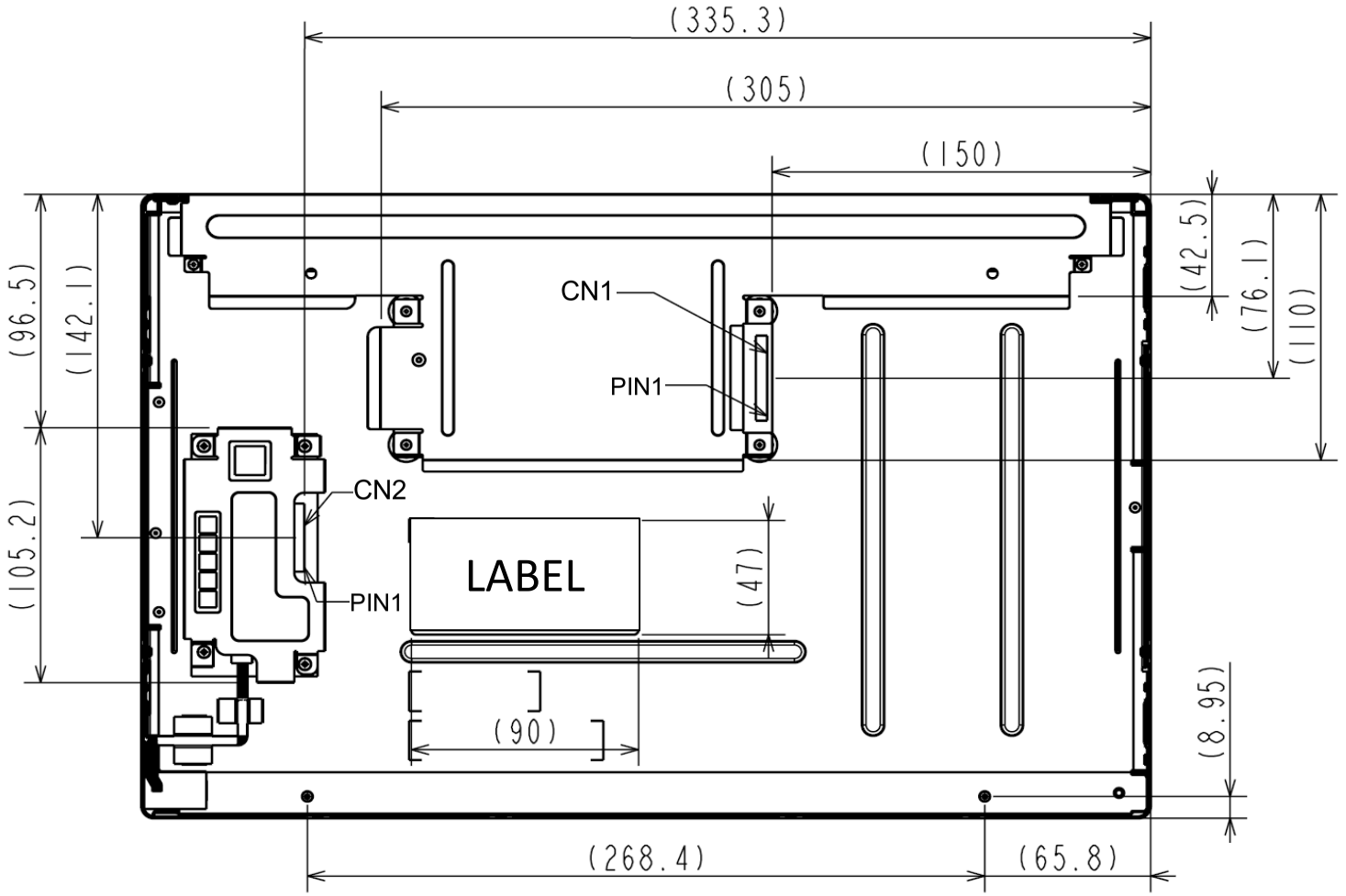


Note

1) Interface connector (CN1)
   JAE: FI-X30SSLA-HF or equivalent
2) Converter PCB connector (CN2)
   TARNG YU Enterprise: TU2001WNR-12S or equivalent.
3) The unspecified tolerance: ±0.5mm
4) Holes for panel mount : M3: 6 holes (right and left side), M4: 6 holes (upper and lower side)
5) Maximum screwing torque for panel mount : 0.294N・m (3kgf・cm)
6) Screws for panel fixation to the panel frame.
7) Screws for LED bar fixation. (M3)

Unit: mm
Scale:NTS

10.2 FRAR VIEW



Unit: mm
Scale:NTS

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11. APPEARANCE STANDARD

11.1 CONDITIONS FOR COSMETIC INSPECTION

(1) Viewing zone

a) The figure shows the correspondence between eyes (of inspector) and TFT-LCD module.

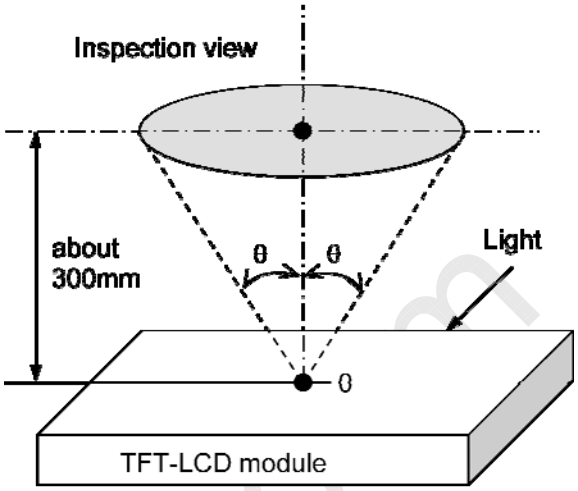
θ ＜ 45° : when non-operating inspection

θ ＜ 5° : when operating inspection

b) Inspection should be executed only from front side and only A-zone.

Cosmetic of B-zone and C-zone are ignore.

(refer to 9.2 DEFINITION OF ZONE)



(2) Environmental

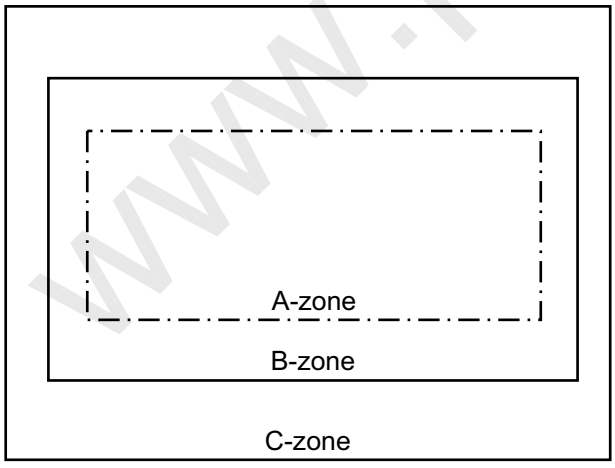
a) Temperature ： 25°C

b) Ambient light ： about 700 lx and non-directive when operating inspection.

：about 1000 lx and non-directive when non-operating inspection.

c) Back-light ：when non-operating inspection, back-light should be off.

11.2 DEFINITION OF ZONE



A-zone ： Display area (pixel area).

B-zone ： Area between A-zone and C-zone.

C-zone ： Metal bezel area.
(Include I/F connector)

11.3 LCD APPEARANCE SPECIFICATION

The specification as below is defined as the amount of unexpected phenomenon or material in different zones of LCD panel. The definitions of length, width and average diameter using in the table are shown in Fig. 11.3 and Fig. 11.4.

<table>
<tr><th>Item</th><th colspan="4">Criteria</th><th>Applied zone</th></tr>
<tr><td rowspan="8">Scratches</td><td>Length (mm)</td><td>Width (mm)</td><td>Maximum number</td><td>Minimum space</td><td rowspan="8">A,B</td></tr>
<tr><td>Ignored</td><td>W≦0.02</td><td>Ignored</td><td>-</td></tr>
<tr><td>L≦40</td><td>W≦0.04</td><td>10</td><td>-</td></tr>
<tr><td>L≦20</td><td>W≦0.08</td><td>10</td><td>-</td></tr>
<tr><td colspan="4">Round (Dot Shape)</td></tr>
<tr><td>Average diameter (mm)</td><td colspan="2">Maximum number</td><td>Minimum space</td></tr>
<tr><td>D≦0.2</td><td colspan="2">Ignore</td><td>-</td></tr>
<tr><td>D≦0.6</td><td colspan="2">10</td><td>-</td></tr>
<tr><td>Dent</td><td colspan="4">Serious one is not allowed</td><td>A</td></tr>
<tr><td>Wrinkles in polarizer</td><td colspan="4">Serious one is not allowed</td><td>A</td></tr>
<tr><td rowspan="5">Bubbles on polarizer</td><td colspan="2">Average diameter (mm)</td><td colspan="2">Maximum number</td><td rowspan="5">A</td></tr>
<tr><td colspan="2">D≦0.3</td><td colspan="2">Ignored</td></tr>
<tr><td colspan="2">0.3＜D≦0.5</td><td colspan="2">10</td></tr>
<tr><td colspan="2">0.5＜D≦1.0</td><td colspan="2">5</td></tr>
<tr><td colspan="2">1.0＜D</td><td colspan="2">none</td></tr>
<tr><td rowspan="13">1) Stains
2) Foreign Materials
3) Dark Spot</td><td colspan="4">Filamentous (Line shape)</td><td rowspan="5">A,B</td></tr>
<tr><td>Length (mm)</td><td colspan="2">Width (mm)</td><td>Maximum number</td></tr>
<tr><td>-</td><td colspan="2">W≦0.02</td><td>Ignored</td></tr>
<tr><td>L≦4.0</td><td colspan="2">W≦0.04</td><td>8</td></tr>
<tr><td>L≦2.0</td><td colspan="2">W≦0.08</td><td>8</td></tr>
<tr><td>-</td><td colspan="2">W＞0.08</td><td>Dot Shape</td><td rowspan="6">A,B</td></tr>
<tr><td colspan="4">Round (Dot shape)</td></tr>
<tr><td>Average diameter (mm)</td><td colspan="2">Maximum number</td><td>-</td></tr>
<tr><td>D≦0.22</td><td colspan="2">Ignored</td><td>-</td></tr>
<tr><td>D≦0.5</td><td colspan="2">8</td><td>-</td></tr>
<tr><td>D＞0.5</td><td colspan="2">None</td><td>-</td></tr>
<tr><td colspan="4">Those wiped out easily are acceptable</td></tr>
<tr><td rowspan="10">Dot-Defect
(Note 1)</td><td colspan="2"></td><td>Type</td><td>Maximum number</td><td rowspan="10">A</td></tr>
<tr><td colspan="2" rowspan="4">Bright dot-defect</td><td>1 dot</td><td>6</td></tr>
<tr><td>2 adjacent dot</td><td>3</td></tr>
<tr><td>3 adjacent dot or above</td><td>Not allowed</td></tr>
<tr><td>In total</td><td>6</td></tr>
<tr><td colspan="2" rowspan="4">Dark dot-defect</td><td>1 dot</td><td>9</td></tr>
<tr><td>2 adjacent dot</td><td>5</td></tr>
<tr><td>3 adjacent dot or above</td><td>Not allowed</td></tr>
<tr><td>In total</td><td>9</td></tr>
<tr><td colspan="3">In total</td><td>15</td></tr>
</table>

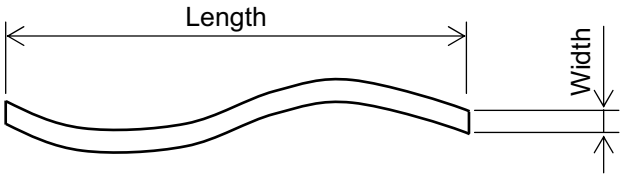
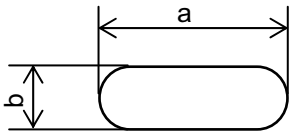


Fig 11.3



Average diameter = $\frac{a+b}{2}$

Fig 11.4

Note 1: The definitions of dot defect are as below:

- The defect area of the dot must be bigger than half of a dot.
- For bright dot-defect, showing black pattern, the dot's brightness must be over 30% brighter than others.
- For dark dot-defect, showing white pattern, the dot's brightness must be under 70% darker than others.
- The definition of 1-dot-defect is the defect-dot, which is isolated and no adjacent defect-dot.
- The definition of adjacent dot is shown as Fig. 11.5.
- The Density of dot defect is defined in the area within diameter ϕ =20mm.

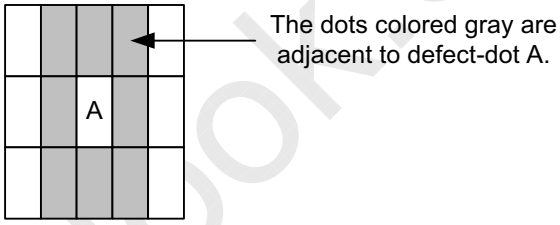


Fig 11.5

Note 2: Polarizer area inside of B-Zone is not applied.

12. PRECAUTIONS

12.1 PRECAUTIONS of ESD

1) Before handling the display, please ensure your body has been connected to ground to avoid any damages by ESD. Also, do not touch display's interface directly when assembling.

2) Please remove the protection film very slowly before turning on the display to avoid generating ESD.

12.2 PRECAUTIONS of HANDLING

1) In order to keep the appearance of display in good condition, please do not rub any surfaces of the displays by sharp tools harder than 3H, especially touch panel, metal frame and polarizer.

2) Please do not pile the displays in order to avoid any scars leaving on the display. In order to avoid any injuries, please pay more attention for the edges of glasses and metal frame, and wear finger cots to protect yourself and the display before working on it.

3) Touching the display area or the terminal pins with bare hand is prohibited. This is because it will stain the display area and cause poor insulation between terminal pins, and might affect display's electrical characteristics furthermore.

4) Do not use any harmful chemicals such as acetone, toluene, and isopropyl alcohol to clean display's surfaces.

5) Please use soft cloth or absorbent cotton with ethanol to clean the display by gently wiping. Moreover, when wiping the display, please wipe it by horizontal or vertical direction instead of circling to prevent leaving scars on the display's surface, especially polarizer.

6) Please wipe any unknown liquids immediately such as saliva, water or dew on the display to avoid color fading or any permanently damages.

7) Maximum pressure to the surface of the display must be less than $1{,}96 \times 10^4$ Pa. If the area of adding pressure is less than 1 cm^2, the maximum pressure must be less than 1.96N.

12.3 PRECAUTIONS OF OPERATING

1) Please input signals and voltages to the displays according to the values defined in the section of electrical characteristics to obtain the best performance. Any voltages over than absolute maximum rating will cause permanent damages to this display. Also, any timing of the signals out of this specification would cause unexpected performance.

2) When the display is operating at significant low temperature, the response time will be slower than it at 25 C°. In high temperature, the color will be slightly dark and blue compared to original pattern. However, these are temperature-related phenomenon of LCD and it will not cause permanent damages to the display when used within the operating temperature.

3) The use of screen saver or sleep mode is recommended when static images are likely for long periods of time. This is to avoid the possibility of image sticking.

4) Spike noise can cause malfunction of the circuit. The recommended limitation of spike noise is no bigger than $\pm$ 100 mV.

12.4 PRECAUTIONS of STORAGE

If the displays are going to be stored for years, please be aware the following notices.

1) Please store the displays in a dark room to avoid any damages from sunlight and other sources of UV light.

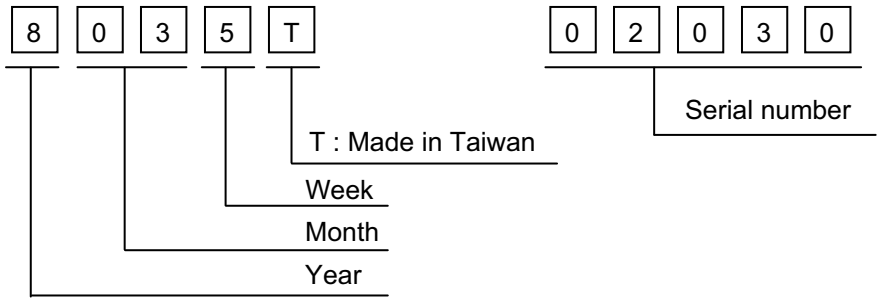
2) The recommended long term storage temperature is between 10℃~35℃ and 55%~75% humidity to avoid causing bubbles between polarizer and LCD glasses, and polarizer peeling from LCD glasses.

3) It would be better to keep the displays in the container, which is shipped from KOE, and do not unpack it.

4) Please do not stick any labels on the display surface for a long time, especially on the polarizer.

13. DESIGN ATION OF LOT MARK

1) The lot mark is showing in Fig.13.3. First 4 digits are used to represent production lot, T represented made in Taiwan, and the last 5 digits are the serial number.



2) The tables as below are showing what the first 4 digits of lot mark are shorted for.

Year	Mark
2012	2
2013	3
2014	4
2015	5
2016	6

Month	Mark	Month	Mark
1	01	7	07
2	02	8	08
3	03	9	09
4	04	10	10
5	05	11	11
6	06	12	12

Week (Days)	Mark
1~7	1
8~14	2
15~21	3
22~28	4
29~31	5

3) Except letters I and O, revision number will be shown on lot mark and following letters A to Z.

4) The location of the lot mark is on the back of the display shown in Fig. 13.3.

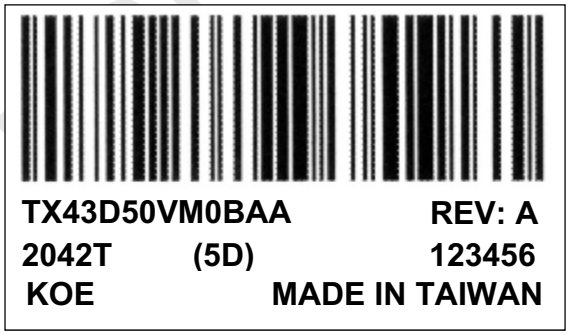


Fig 13.3